

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 11298-3-1 (1991): Plastic films for electrical purposes, Part 3: Specifications for individual materials, Section 1: Polypropylene films for capacitors [ETD 2: Solid Electrical Insulating Materials and Insulation Systems]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



IS 11298 (Part 3/Sec 1) : 1991

भारतीय मानक

विद्युत प्रयोजनों के लिए प्लास्टिक फिल्म – विशिष्ट

भाग 3 अलग-अलग सामग्री

अनुभाग 1 संधारित्रों के लिए पॉलीप्रोपाइलीन फिल्म

(पहला पुनरीक्षण)

Indian Standard

PLASTIC FILMS FOR ELECTRICAL
PURPOSES — SPECIFICATION

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 1 Polypropylene Films for Capacitors

(*First Revision*)

UDC 621.315.616.96.416 : (678.742.3) : 621.319.4

© BIS 1991

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 1991

Price Group 2

FOREWORD

This Indian Standard (Part 3/Sec 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Solid Electrical Insulating Materials Sectional Committee had been approved by the Electrotechnical Division Council.

This standard is one of the series of Indian Standards which deals with plastic films for electrical purposes. The series consists of the following three parts:

Part 1 Definitions and general requirements;

Part 2 Methods of test; and

Part 3 Specifications for individual materials.

This standard covers the requirements for polypropylene films for capacitors.

The first revision of the standard has been undertaken to take care of the experience and feedback received from the industry.

In the preparation of this standard, assistance has been derived from IEC Doc : 15C (Central Office) 143 'Specification for plastic films for electrical purposes: Part 3 Specification for individual materials. Sheet 1 Requirements for polypropylene films for capacitors, issued by the International Electrotechnical Commission (IEC).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PLASTIC FILMS FOR ELECTRICAL PURPOSES — SPECIFICATION

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 1 Polypropylene Films for Capacitors

(*First Revision*)

1 SCOPE

1.1 This standard (Part 3/Sec 1) covers the requirements of plain and hazy polypropylene films (non-metallized) for capacitors. The material shall be made from polypropylene homopolymer and shall conform to IS 11298 (Part 1) : 1985, unless otherwise specified in this standard.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this Standard:

<i>IS No.</i>	<i>Title</i>
4905 : 1968	Methods for random sampling
11298 (Part 1) : 1985	Specification for plastic films for electrical purposes : Part 1 Definitions and general requirements
11298 (Part 2) : 1987	Specification for plastic films for electrical purposes : Part 2 Methods of tests

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 11298 (Part 1) : 1985 shall apply.

4 GENERAL REQUIREMENTS

4.1 All materials in a consignment shall comply with the requirements given in IS 11298 (Part 1) : 1985.

4.2 The join of the film shall be at not more than one place for a length of the film up to 1 000 metres. Each roll shall not contain more than two joins. A bright coloured pressure sensitive adhesive tape visible from both ends of the roll shall be used so that the position of the join is easily known to the operator.

4.3 Alignment of Core

The width of the core shall not be less than that of the film.

4.4 Telescoping

The axial shifting of sections of the slit roll relative to other annular sections shall be as follows:

Up to 150 mm width	: 0.5 mm maximum
Beyond 150 mm width	: 1.0 mm maximum

4.5 Shiner in the Slit Roll

The shiner is a misalignment of one or more turns which displays a shining appearance. Shiners may be allowed at the start of a slit roll or at a join, but they shall not exceed 1 mm.

4.6 Camber in the Slit Roll

For widths up to 380 mm, the camber should not exceed 3 mm when a film 1.5 metre in length is laid on a smooth flat surface.

4.7 Surface of the Film in Slit Rolls

The surface of the film shall be uniform and non-blocking. It shall be free from line marks, particulate matter, blisters, wrinkles and ripples so as to be functionally acceptable. The optical properties shall be consistent from roll to roll.

4.8 Resin

The film shall be manufactured from virgin, electrical grade polypropylene resin of isotactic content not less than 94 percent.

4.9 Orientation

The film shall be fully oriented so as to have balanced physical properties.

4.10 Sag in the Slit Roll

The procedure for the determination of sag has been outlined in 7.3.3 of IS 11298 (Part 2) : 1987.

The sag so measured shall not exceed one percent of the width of the slit roll employed for measurement.

NOTE — The sag should not hinder the smooth winding of the film during capacitor manufacturing.

4.11 Curl on the Slit Roll

The plain polypropylene film shall lay flat when unwound. For the hazy polypropylene film, the flatness is under consideration.

4.12 Shiny Band in the Slit Rolls

In hazy film bends are not desirable. The maximum allowable limit of shiny bend in hazy film is subject to agreement between the purchaser and the supplier.

5 ROUTINE/ACCEPTANCE TESTS

5.1 The following tests shall be carried out to check the conformity or otherwise of the material with respect to the stipulated requirements given in 4 and 6:

- a) Inspection of general requirements (see 4),
- b) Thickness,
- c) Space factor,
- d) Width,
- e) Outside diameter,
- f) Density,
- g) Tensile strength,
- h) Elongation,
- j) Shrinkage,
- k) Dielectric strength,
- m) Volume resistivity,
- n) Dissipation factor,
- p) Dielectric constant and
- q) Electrical weak spots.

6 PERFORMANCE REQUIREMENTS

6.1 When tested according to the relevant methods described in IS 11298 (Part 2) : 1987, the material shall conform to the requirements given in Table 1,

6.2 Liquid Adsorption

For satisfactory construction of impregnated capacitors the adsorption of the impregnant by the film may need to be controlled within certain limits. If required, the method of measurement, the time and temperature used, and the adsorption limits shall be agreed between the supplier and the purchaser. The preferred method shall be as given in 32 of IS 11298 (Part 2) : 1987.

6.3 Compatibility with Impregnants

The compatibility of the film with selected dielectric fluids shall be determined using a method, agreed upon between the supplier and the purchaser. This method may, for example, be based on swelling or solubility of the film in the fluid on contamination of the fluid or the film.

6.4 Dissipation Factor Under Impregnated Conditions

The impregnants and the methods of testing used throughout the capacitor industry vary widely and many of the materials and procedures are proprietary.

Where dissipation factor of film under impregnated conditions must be to an agreed standard, the limiting values and the method of measurement must be agreed between the supplier and the purchaser.

NOTE — In consideration of the wide variety of impregnants today available and under development for capacitor application, no specific tests and/or limits can be given in this standard, for example, see 6.2 for liquid adsorption, 6.3 for specification compatibility with dielectric fluids, and 6.4 for dissipation factor under impregnated conditions.

Table 1 Propertywise Requirements for the Rough (Hazy) and Plain Polypropylene Film (Applicable to Slit Rolls Only)
(Clause 6.1)

Sl No.	Property	Clause Ref. of IS 11298 (Part 2)-1987	Requirements	Tolerance	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
1.	Thickness in microns	4.5	Preferred thickness a) For plain film :—6, 8, 10, 12, 14, 15.2, 16.5, 18 and 20 b) For Hazy film :—8, 9, 10, 11, 12, 14, 15.2, 16.5, 18 and 20	±6% ±6%	Only micrometer thickness shall be considered Only weight thickness shall be considered
2.	Space factor for hazy film (percent)	4.5	10	±2	The space factor calculated on each of the ten micrometer reading shall be within 5-16 percent
3.	Width in mm	8	Preferred widths are not given on account of the great variety of capacitors in which the films are to be used	±0.5 mm up to 150 mm ±1.0 mm above 150 mm width	The width of the film is a subject of agreement between the purchaser and the supplier
4.	Roll outside diameter in mm	—	200	±25	—
5.	Density (gm/cm ³)	6.1.2	0.905	±0.005	—
6.	Tensile strength at break (N/mm ²) i) along MD ii) along CMD	12	140	Minimum specified	Rate of travel of the tensometer should be 100 mm/minute
7.	Elongation at break both along MD and CMD (percent)	12	40	Minimum Specified	—
8.	Heat shrinkage (percent): i) along MD ii) along CMD	24	4 2	Maximum Maximum Average	Test conditions: 100°C for 10 minutes The rate of rise of voltage shall be 500 volts sec
9.	DC Dielectric strength (volts/micron) Breakdown voltage (kV/mm)	19.2	Nominal thickness in microns 6 8-11 ≥12	250 300 450	The value shall be computed on the basis of 50 observations
10.	Volume resistivity (in ohm-cm) at 27±2°C and 60±5% RH	16	1 × 10 ¹⁶	350 400 525 Minimum specified value	Film thickness (in microns) Level of voltage applicable (in volts)
11.	Dissipation factor at 27°C, 48-52 Hz and 500 volts AC	17	2 × 10 ⁻⁴	Number of samples = 5 Maximum specified value	Central value of five results shall be reported, The sample size shall be such, as to suit the electrodes employed
12.	Dielectric constant at 27°C and 48-52 Hz	17	2.2	±0.05	—
13.	Electrical weakspots (counts/5 m ²)	20	Nominal film thickness in microns 6 8 and 9 10 and 11 12 ≥14	Maximum No. of permissible weak spots measured over a film area of 5m ² 6 4 3 2 1	The test voltage to be applied shall be 200 V DC per micron based on the nominal thickness of the film. Sensitivity shall be specified

NOTE 1 — Each and every slit roll shall be marked with weight thickness calculated from the net weight or the slit roll, length and assumed density of 0.905 gm per cubic cm.

NOTE 2 — For a lot of more than one ton, the average weight thickness shall not vary by more than ±5 percent of the nominal value.

NOTE 3 — For determining the space factor for hazy films, micrometer and weight thickness shall be measured on the same sample of a slit roll.

NOTE 4 — Sampling plan shall be as per Annex A.

ANNEX A

(Table 1, Note 4)

SAMPLING PLAN**A-1 SAMPLING****A-1.1 Lot**

All the slit rolls of the same size manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

A-1.2 The number of slit rolls to be selected from each lot shall depend upon the size of the lot and shall be in accordance with columns 1 and 2 of Table 2. These slit rolls shall be selected from the lot at random. In order to ensure the randomness of selection, procedure given in IS 4905 : 1968 (Methods for random sampling) shall be followed.

A-1.3 Criteria for Conformity

The slit rolls selected at random according to columns 1 and 2 of Table 2 shall be subjected to each of the tests. A slit roll failing to satisfy the requirement of any of these tests shall be termed

as defective. The lot shall be considered as conforming to these requirements if the number of defectives found in the sample is less than or equal to the corresponding permissible number given in column 3 of Table 2, otherwise the lot shall be rejected.

Table 2 Sample Size and Permissible Number of Defectives

Lot Size	Sample Size	Permissible Number of Defectives
(1)	(2)	(3)
Up to 50	5	0
51 to 100	8	0
101 to 300	13	1
301 to 500	20	1
501 to 1 000	32	2
1 001 and above	50	3

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference:

Doc : No. ETD 2 (3318)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

Telephone

{ 311 01 31
{ 331 13 75

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola
CALCUTTA 700054

37 86 62

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036

53 38 43

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

235 02 16

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
BOMBAY 400093

6 32 92 95

Branches : AHMADABAD, BANGALORE, BHOPAL, BHUBANESHWAR, COIMBATORE,
FARIDABAD, GHAZIABAD, GUWAHATI, HYDERABAD, JAIPUR, KANPUR,
PATNA, THIRUVANANTHAPURAM.